

AIR FORCE PLANT PJKS, SYSTEMS INTEGRATION
LABORATORY, LONG-TERM HYDRAZINE SILO
(Air Force Plant PJKS, Systems Integration
Laboratory, Building T-28E)
Waterton Canyon Road and Colorado Highway 121
Lakewood Vicinity
Jefferson County
Colorado

HAER No. CO-88-F

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain System Support Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225-0287

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AIR FORCE PLANT PJKS, SYSTEMS INTEGRATION LABORATORY, LONG-TERM HYDRAZINE SILO

(Air Force Plant PJKS, Systems Integration Laboratory, Building T-28E)

HAER No. CO-88-F

Location: Waterton Canyon Road and Colorado Highway 121, Lakewood Vicinity, Jefferson County, Colorado

Date of Construction: 1960-61

Fabricator: Kaiser Steel Corporation, Fabricating Division, Montebello, California

Present Owner: U.S. Air Force

Present Use: Deactivated, currently vacant

Significance: The Long-Term Hydrazine Silo played a significant role in the development of the Titan II ICBM, which not only served as the largest and most destructive weapon in the U.S. nuclear arsenal during the Cold War (1962-87) but also functioned as a launch vehicle for the Gemini space program in 1965. The structure was designed to assess long-term environmental impacts on storage of the missile's fuel (hydrazine) as part of the Systems Integration Laboratory complex that was constructed to test, handle, and store the Titan II's fuel system propellants. Testing and evaluation of the long-term environmental impacts on the missile's propellant was critical to missile research and development and contributed to the success of the exceptionally significant Titan II program.

Historian: Harlan D. Unrau, National Park Service, Denver Service Center, 1999.

Description: Constructed in 1960-61, the Long-Term Hydrazine Silo (T-28E) was designed to evaluate long-term environmental impacts and effects on storage of the Titan II's fuel propellant. The use of hydrazine as missile fuel was new, and little information regarding long-term storage of the propellant was available. This structure, which served the same purpose for hydrazine as the Long-Term Oxidizer Silo (T-28B) did for nitrogen tetroxide, supported testing measures that subjected hydrazine to an accelerated environmental cycle of heat and cold, simulating long-term environmental exposure. Thus, it measured the effects of long-term environmental change upon the stored propellant in an accelerated fashion.

During testing the hydrazine was stored in the silo for varying periods extending to more than one year. Test results indicated that when the hydrazine was placed in the aluminum silo, which was chromate conversion coated, there was no reaction, thus

demonstrating the viability of storing the hydrazine in Titan II propellant tanks for lengthy periods of time.

Located on a bench approximately 500' east of the Cold Flow Laboratory (T-6), this structure is located north-northwest of the Systems Integration Laboratory Building (T-28) at the northern edge of the Systems Integration Laboratory complex. It was functionally linked to additional buildings in the complex. By 1971, a Fuel Purification Structure (T-28C), an Armco-type steel building designed to purify hydrazine for long-term hardware requirements for satellites and space expedition vehicles associated with the Titan III launch vehicle, had been constructed adjacent to the south side of the Long-Term Hydrazine Silo. The Fuel Purification Structure also contained an air conditioning unit for the silo structure. The silo was deactivated during the early to mid 1970s.

The circular concrete foundation (approximately 23'-6") for the Long-Term Hydrazine Silo was constructed in 1960-61, and the aluminum silo was moved from its location in the Fuel Storage Area at the Cold Flow Laboratory and placed on the foundation between late April and early July 1961.

A circular foundation wall 19'-6" in diameter, 1' thick, and 12' in height rests on the pad. A curvilinear concrete stair extends to the top of the wall on the east side of the structure. A door is located at the top of the stair. Inside the door, a curvilinear stair extends around the silo structure. Four two-sash windows are located on the east and west sides of the silo. Originally, a small aluminum metal shed, referred to as a machine room, with sloping metal roof, was attached to the south-southwest side of the silo structure, and a flume extended from the silo to a fuel waste tank downhill to the south-southwest of the silo.

The deactivated Long-Term Hydrazine Silo has undergone little structural modification since its construction, and onsite examination found no evidence of significant structural modifications. However, use of this structure to support testing of later missile systems has resulted in upgrades and modifications to its technological systems and instrumentation.

History: The Long-Term Hydrazine Silo was constructed on Air Force property adjacent to the Martin Company's Denver Division plant during 1960-61. In May 1960, the Martin Company contracted with the Kaiser Steel Corporation, Fabricating Division, of Montebello, California, to prepare design specifications for and construct the structure as part of the Systems Integration Laboratory complex for Titan II propellant testing. The specifications and design drawings, based on design criteria developed by Martin Company Cold Flow Laboratory personnel, were prepared by ARCAL, Engineers-Constructors of Pasadena, California, under a subcontract from Kaiser Steel. Initial construction operations began in late June or early July 1960. Construction was completed by early March 1961.

The facilities in the Long-Term Hydrazine Silo were utilized for testing and evaluation of long-term environmental impacts on storage of hydrazine during the Titan II testing program from 1961 to 1964. Subsequently, the facility played a significant role in fuel testing for subsequent Titan launch vehicle systems until its deactivation in the 1970s.

Sources: Sources include architectural drawings, blueprints, and site plans in the Engineering Propulsion Laboratory and Plant Engineering and Construction Department at Lockheed Martin Astronautics. The corporation's Photographic Laboratory, Reproduction Services Department maintains an extensive collection of black and white and color photographs depicting construction, equipment, and testing activities at the Systems Integration Laboratory complex. Typescript copies of the contract and specifications for the structure may be found in the Archives of the corporation's Engineering Propulsion Laboratory.

Printed and/or published materials relating to the design and utilization of the structure include: "Criteria For the Design of XSM 68B Cold Flow Systems Test Laboratory and Components Test Laboratory, The Martin Company, Denver Division, Denver, Colorado, April 15, 1960," Compiled by Cold Flow Laboratory Facilities Group (copy in Archives, Engineering Propulsion Laboratory, Lockheed Martin Astronautics); "Part II Valuations for Appraisal of Government-owned Test Area, Sections 20, 21, 28, 29, T6S, R69W, 6th P.M., Jefferson County, Colorado for Martin Marietta Corporation by Blaine B. Chase, MAI, SRA, and Wilson W. Wampler, July 1, 1971 (copy in Plant Engineering and Construction Department, Lockheed Martin Astronautics); and U.S. Department of the Air Force, Air Force Materiel Command, Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio and U.S. Department of the Army, Fort Worth District, Corps of Engineers, Fort Worth, Texas, Historic Building Inventory and Evaluation, Air Force Plant PJKS, Jefferson County, Colorado, prepared by EARTH TECH, Colton, California, and William Manley Consulting, San Diego, California, February 1997. Completion of the structure and the laboratory complex is chronicled in "Main Area Profiles Change With Plant, Titan II Facilities," Martin Mercury 18 (10 March 1961): 2A, 2C; "First Titan II Propulsion System Test Firing at M-D," Martin Mercury 18 (16 June 1961): 2C; and "Titan II Passes Its First Captive Firing," M News 19 (12 January 1962): 1, 3.